

Internet of Things in Health Care

Educational Briefing for Non-IT Executives

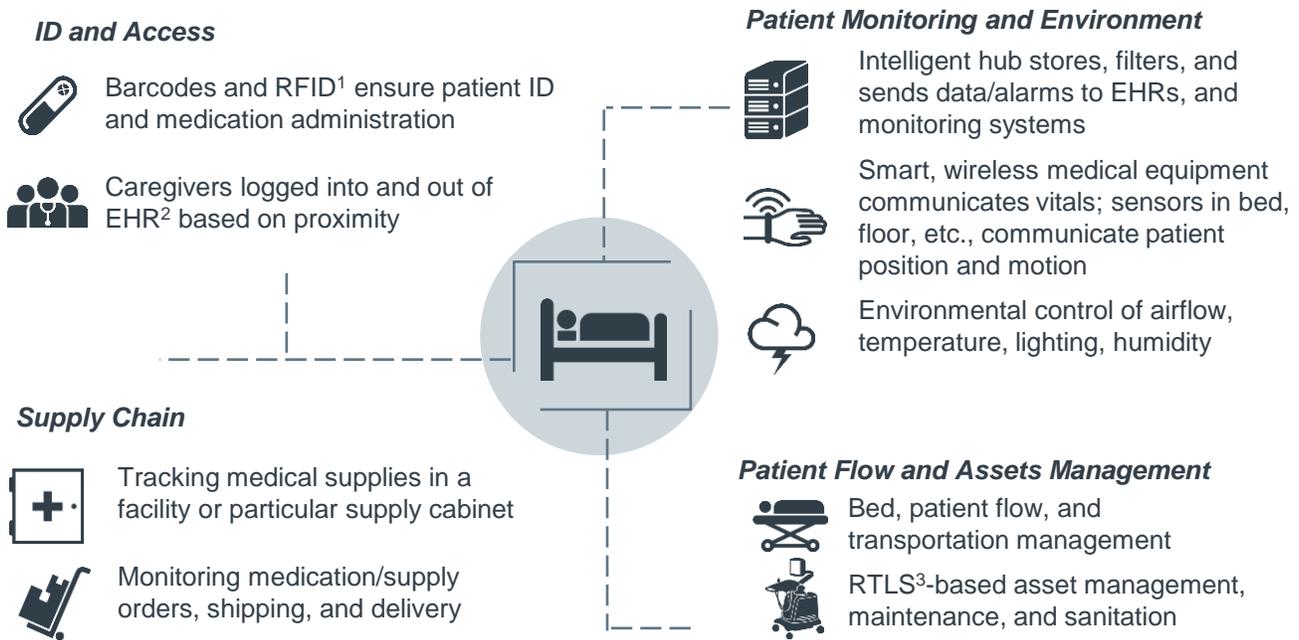
Executive Summary

The Internet of Things (IoT) describes the addition of intelligence and connectivity to everyday objects through recent advances in low-cost, low-power computing, communications and sensor technologies. Wearables, smart homes, and smart vehicles can sense and react to events and their environment. Health care organizations are experimenting with IoT to try to improve care and efficiency within the health system, as well as connecting health care processes with the patient's daily life. IoT devices have the potential to provide valuable data to help predict adverse events (e.g., fall risk, changes in daily routine), improve care plan adherence (e.g., smart medication dispensers), and streamline processes within health care organizations. Challenges for IoT include immaturity of the technologies in medical settings, ensuring security, protecting patient privacy, managing the flood of data the devices create, and a lack of user familiarity with the technologies.

What is the IoT?

The IoT refers to the addition of computing power, connectivity, and sensors to everyday objects, which can include appliances, sensors, monitors, controllers, wearables, medical devices, pill boxes, and many others. Smart objects are often capable of exhibiting some sort of autonomous behavior, usually driven by software. The IoT extends the "conventional" Internet of information-focused devices (e.g., computers, tablets, and phones) to encompass devices that exist primarily to serve some physical need. By connecting IoT objects together, it's possible to capture previously unavailable data about processes and coordinate the behavior of devices in an environment. Smart buildings can adjust heating and lighting based on an understanding of occupancy, public holidays, and weather forecasts. Smart pill dispensers have the potential to not only remind patients to take their medicine, but also inform the care team when a patient is not taking important medications reliably. At the most basic level, RFID¹ tags help track the movement of patients, equipment, consumables, and staff through a facility and help to analyze processes, manage inventories, and locate resources.

Intelligent Hospitals and the IoT



1) RFID = Radio-frequency identification.
 2) EHR = Electronic health record.
 3) RTLS = Real-time location system.

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Source: Health Care IT Advisor research and analysis.

How is the IoT used or applied in health care?

Here are several health care use cases that demonstrate the potential value of IoT technologies:

- **Medication adherence**—Has the patient taken her meds? Primary data sources, such as a smart pill dispenser or interactive voice response (IVR) system, can be supported by additional information such as whether there is a sufficient supply of medications in the home, whether the patient is alone or not, whether she had recently eaten or drank (and what she had consumed).
- **Supply chain**—Are there enough medical supplies at the medical facility or in a particular supply cabinet? In addition to a primary inventory check, supporting information might include how many patients are currently in the facility, how much of a particular medication can be stored in the refrigerator, is the refrigerator functioning properly, was a new order handled appropriately in transit, have we lost any equipment and when and where was it last seen?
- **Intelligent hospital room**—Which devices are hooked up to the patient and in use? Primary information includes patient and device identification, readings, and status. Additional information can include the presence of caregivers, food delivery, etc. Related and broader initiatives can include location and status of medical devices, patients, wheelchairs, beds, etc.
- **Hospital infection control**—Are the necessary precautions being taken to prevent infection? Supporting information could include whether the caregiver approached a sink between patients, whether soap had been dispensed, and if the medical equipment in the room had been properly cleaned. Where had the patient been? With whom and with what had he been in contact?

Why is it important?

The IoT can be used to supplement primary information with secondary/supporting data. For example, one of the greatest areas of concern for remote patient monitoring data is the accuracy and confidence of that data. If the caregiver were convinced that the patient data (e.g., respiration rate) was captured under certain conditions (e.g., pollen count, air temperature, activity level), he or she might choose to ignore or discount its accuracy.

How does the IoT affect health care providers and IT leaders?

A new source of data

- IoT data is captured by sensors, monitors, and other types of devices. Data can include information about the environment, a user's activity, device status, inventory levels, and many others.

A greater focus on the vendor ecosystem

- Adopters need to look for groupings of technologies based on a common vendor ecosystem and platform—approaches that can leverage the same wireless networks, hubs, rule engines, and interoperability standards.

Questions That Hospital Executives Should Ask Themselves

- 1 What initial applications should our organization consider with the IoT?
- 2 What framework can we develop to make sense of the many types of data to monitor and process?
- 3 How can IoT data be leveraged effectively while ensuring patient information privacy and security?
- 4 Do we have the skills and infrastructure to support IoT devices?

Additional Advisory Board research and support available



Report: [The Internet of Things \(IoT\) in Health Care](#)



Webconference: [The Hospital of the Future](#)